Findings of the EPA national investigation into firefighting foams containing PFOS

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Environmental Protection Authority
Te Mana Rauhī Taiao

New Zealand Government

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Executive Summary

In December 2017, the Environmental Protection Authority (EPA) began a national investigation into whether certain firefighting foams were present at airports and other locations in New Zealand. The foams under investigation contain a banned chemical, perfluorooctanesulfonate (PFOS). This report describes the outcome of this initiative.

PFOS foams were restricted in New Zealand in 2006 when they were excluded from the Firefighting Chemicals Group Standard[1], meaning PFOS-containing foams could no longer be imported into New Zealand, or be manufactured here.

In 2011, an international decision that had recognised PFOS as a persistent organic pollutant[2] was written into New Zealand domestic law[3]. This meant, in addition to the 2006 restriction, any existing products containing PFOS could no longer be used in New Zealand, and strict controls were set to manage their storage and disposal.

Our investigation aimed to find out whether firefighting foams containing PFOS had been imported, manufactured, used, stored, or disposed of in New Zealand beyond these timeframes, and the extent of these activities. This meant ensuring that any non-compliant foam discovered would be removed and disposed of in an approved and safe way, so that it could never be used again. It also meant ensuring that any facilities or equipment in contact with the foam were adequately decontaminated and the clean-up materials disposed of appropriately. Our investigation did not include ensuring compliance with the Resource Management Act, which is the responsibility of the relevant regional councils and territorial local authorities.

During this investigation, we visited or contacted 166 sites, including: 34 commercial airports, 108 sites likely to store large volumes of hydrocarbon fuels (ports, refineries and bulk fuel storage, and petrochemical sites), and 24 ships. Stocks of foam containing PFOS were uncovered at several sites, as detailed below, as well as other foam stocks that had been contaminated with PFOS. Our investigators worked with all parties concerned to ensure that materials were decommissioned and stored appropriately and securely, pending their safe disposal. We also issued four compliance orders during the course of the investigation. Our investigation is ongoing.

We took this action following the discovery by the New Zealand Defence Force of soil and water contamination at the Ohakea and Woodbourne airbases in late 2017. The source of the contamination

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[1] A group standard is a process through which the EPA approves groups of similar substances for use in New Zealand under the HSNO Act 1996. Excluding PFOS and PFOA from the group standard took away the only approval pathway available. We reissued the group standard as the *Firefighting Chemicals Group Standard* in 2017, to take account of changes brought about by health and safety reforms at the time, but this did not affect the restriction on PFOS and PFOA.

[2] PFOS was added to an agreed list of persistent organic pollutants (POPs) under the Stockholm Convention, an international environmental agreement to protect human health and the environment from POPs. For more about PFOS and persistent organic pollutants, see the information box on page 10, and for more about New Zealand and international regulation timeframes, see page 11.

[3] Under the *Hazardous Substances and New Organisms (HSNO) Act 1996*.

was thought to be a specialist type of firefighting foam that may have been deployed during emergencies and training exercises at these airbases.

Known as 'aqueous film-forming' foam, these specialised foams were designed for fires involving large volumes of hydrocarbon fuel, such as aviation emergencies. They have a narrow and specific use, and would not be present in home fire extinguishers, for example.

This investigation was a first for the EPA. Our responsibility is to protect people and the environment by regulating the import, manufacture, supply, use, storage and disposal of hazardous chemicals in New Zealand, including banned chemicals. On 1 December 2017, we assumed new enforcement powers following changes to the law[4] – 19 days before we announced our investigation. These changes gave us new powers to enforce:

- the requirement for hazardous substances to have an official approval for import, manufacture, supply and use in New Zealand
- the prohibitions and requirements for persistent organic pollutants.

Prior to this date, we did not have these powers. This means we were unable to take any enforcement action on non-compliance before then.

Throughout our investigation we also participated in an All-of-Government working group[5]. We balanced the need for an independent investigation while ensuring a cohesive, 'joined-up' approach to dealing with the broader ramifications of the past use of PFOS-containing foams in New Zealand. This approach reflects our role under a broader set of responsibilities shared across government agencies for this situation, including the Ministry for the Environment and the Ministry of Health.

The investigation uncovered firefighting foam containing PFOS at sites across New Zealand. Some of this was the *3M Light Water* aqueous film-forming foam (manufactured using PFOS until 2002), while other foam stocks had lower PFOS concentration levels, likely arising from the previous use of *3M Light Water* in appliances and equipment (contamination).

Firefighting foam containing PFOS was identified:

- at several airports: Gisborne, Palmerston North, Hawkes Bay (Task Protection Services Ltd being contracted to undertake firefighting services for these three airports), Nelson (plus Nelson Airport Fire Services Ltd), Kapiti Coast and Chatham Islands
- at four sites controlled by Shell Taranaki Ltd,
- on one vessel owned by Marine Services Auckland Ltd and another by Lyttelton Port Company, and
- at TRS Tyres in Whanganui.

[4] Changes to the *Hazardous Substances and New Organisms (HSNO) Act 1996*

[5] This working group includes representatives from: Crown Law, the Department of the Prime Minister and the Cabinet (DPMC), the Environmental Protection Authority (EPA), Fire and Emergency New Zealand (FENZ), the Ministry for the Environment (MfE), the Ministry for Primary Industries (MPI), the Ministry of Health (MoH), the New Zealand Defence Force (NZDF), and representatives of local government

Firefighting foam contaminated with lower levels of PFOS was also found at other sites, in tanks and in equipment, including:

- Auckland International, Queenstown, and New Plymouth airports, and
- an Air New Zealand hangar in Auckland.

It is important to stress that no intentional non-compliance was discovered. In all of the instances where PFOS firefighting foam was identified, we concluded it was highly likely the foam had been imported prior to 2006, when importation was legal. Where PFOS-contaminated foams were found, there were considerable challenges around establishing exactly when that contamination occurred. In these instances, we concluded it was reasonably likely that contamination was via PFOS foam that had been imported before 2006.

Our investigators worked with all affected parties to resolve the issue. An aim of the investigation was to secure the best outcome by working with parties, either on a voluntary basis or via a compliance order, to ensure they took the necessary steps for decontamination and disposal in line with technical standards.

The EPA was surprised at the start of the investigation to find *3M Light Water* foam at these sites. Our investigators and science experts had not anticipated that any such foam would be held in active firefighting equipment or even in storage. Our view at the time and currently is that these substances had been restricted since 2006 and totally banned since 2011, from which point ignorance was no defence, especially in the professional firefighting sectors.

It was for this reason – and to demonstrate how seriously we took the discovery of non-compliant foams and the associated risks to the public and environment – that the EPA issued three compliance orders early in the investigation to Nelson Airport Fire Service Ltd, Nelson Airport and Task Protection Services Ltd[6]. A later compliance order served to Lyttelton Port Company addressed their reluctance to face the issue. The compliance orders included actions to seek technical advice from an environmental consultant and to supply us with a management plan detailing an acceptable process for the removal of non-compliant materials. We do not rule out issuing further compliance orders, if they are required.

When PFOS is present in equipment and systems (in firefighting trucks, firefighting systems in tug boats, deluge firefighting systems at tank farms, and aircraft hangars), achieving decontamination can require complex and protracted steps. Numerous sites were required to flush and clean out equipment and systems to ensure they would not re-contaminate compliant foam when used again. These sites also needed to ensure that any discharges from this flushing process complied with Resource Management Act (RMA) requirements and trade waste by-laws. To assist this process, we provided guidance on our website[7] about the limits of PFOS concentration that may be acceptable for disposal

[6] Task Protection Services Ltd was under contract to provide firefighting services for Hawke's Bay, Palmerston North and Gisborne airports

[7] To read our guidance: *How to dispose of firefighting foams containing PFOS*

at landfills and wastewater treatment sites (depending on local acceptance criteria), and also encouraged the sites' operators to hire and consult their own technical experts for advice.

In all cases, the parties took our direction, and complied with legal storage and labelling obligations. At the time of writing:

- we have received and approved applications for export permits for the environmentally-sound disposal of the foam (at high concentrations of PFOS, disposal involves export for high-temperature incineration, to meet New Zealand's international obligations)
- the PFOS foam from Kapiti airport has been exported for environmentally-sound disposal
- eight organisations have completed the removal and/or clean-up of their equipment, and their PFOS materials were collected and are pending disposal (Nelson, Hawkes Bay, Palmerston North, New Plymouth, and Chatham Islands airports; Nelson Airport Fire Services Ltd; Auckland International Airport and Air New Zealand Auckland hangar); the rinsate (rinsing water) from Nelson Airport Fire Services Ltd, Nelson airport, Air New Zealand Auckland hangar and New Plymouth was treated and decontaminated on site, tested and disposed of according to local council trade waste rules
- Shell Taranaki Ltd has decontaminated and removed their PFOS materials from four sites into safe storage at one site, including the rinsate
- Gisborne airport is scheduled for decontamination on 10–13 April 2019
- Queenstown airport, Marine Services Auckland Ltd, Lyttelton Port Company Ltd and TRS Tyres Ltd are actively working with environmental consultants to manage their sites.

Because of the protracted nature of the steps that sometimes have to be taken, we cannot yet verify that full compliance has been achieved in all cases. Nonetheless, our enforcement was successful and we consider substantial compliance has been achieved, and our investigators remain vigilant and will follow up for verification, where needed.

No prosecutions were made. We considered that an approach involving prosecution was not needed in the context of addressing the reasons behind non-compliance at the various sites, particularly where those under investigation demonstrated that they were willing to comply, but this does not rule out prosecution in the future, if it is warranted.

We consider it is appropriate to issue this report now, while acknowledging that some parties still have steps to take to fully meet their compliance obligations. We recognise the significant public interest in matters to do with PFOS-containing firefighting foams, and believe it is important to share our investigation's main conclusions with the public at this stage.

We expect there will be enduring behavioural change for the better regarding the PFAS family of chemicals as a result of this investigation. The EPA continues to work towards ensuring that PFOS foams are removed and disposed of in an approved and safe way, leaving the New Zealand environment free from the threat of future contamination.

Background

1. The New Zealand Defence Force (NZDF) discovered soil and water contamination from PFOS and PFOA at the Ohakea and Woodbourne airbases (for more information about PFOS and PFOA, see inset on following page). The level of contamination observed was above the interim guidelines for drinking water that had been adopted by the Ministry of Health in 2017[8].
2. The source of the contamination was thought to be a specialist type of firefighting foam used for combating fires involving fuel. This foam may have been deployed during emergencies and during training exercises at these airbases.
3. On 7 December 2017, the Minister for the Environment announced an All-of-Government investigation and mitigation measures for potential water contamination at NZDF facilities at the Ohakea and Woodbourne airbases. Councils and communities were given support to identify other sites across New Zealand (including Crown-owned sites).
4. This All-of-Government investigation was focused on water contamination and land remediation for public health and safety.
5. We, the EPA, announced our own independent investigation on 20 December 2017.
6. Our investigation aimed to find out whether firefighting foams containing PFOS had been imported, manufactured, used, stored, or disposed of in New Zealand in contravention of any HSNO Act requirements, and the extent of these activities. The scope of this investigation was different from the All-of-Government investigation: this is because the EPA is not responsible for finding or cleaning up soil or water at contaminated sites.
7. This meant ensuring that any non-compliant foam discovered would be removed and disposed of in an approved and safe way, so that it could never be used again. It also meant ensuring that any facilities or equipment in contact with the foam were adequately decontaminated and the clean-up materials disposed of appropriately.
8. The investigation was a first for the EPA: we assumed new enforcement powers following changes to the Hazardous Substances and New Organisms (HSNO) Act 1996. These came into force on 1 December 2017 – just 19 days before we announced our investigation.
9. The changes to the HSNO Act gave us new powers to enforce:
    - the requirement for hazardous substances to have an official approval for import, manufacture, supply and use in New Zealand
    - the prohibitions and requirements that relate to POPs (for more about POPs see next page).

[8] Ministry of Health (2017) *Interim guidance level for drinking water, PFOA, PFOS and PFHxS*

For more information see the Ministry for the Environment website page on PFAS

10. Our investigation did not include ensuring compliance with the Resource Management Act (i.e. that contaminants not be discharged into the environment), which is the responsibility of relevant regional councils and territorial local authorities.
11. We continued to participate in the All-of-Government group to support a joined-up approach. We maintained independent integrity by limiting the sharing of the information discovered through our investigation.

More about PFAS, PFOS, PFOA and POPs

PFAS is a large family of manmade chemicals which have been used in many different types of manufacturing since the 1940s, and in firefighting foams since the 1960s. PFOS (perfluorooctane sulfonic acid) is a member of the PFAS family of chemicals. In the past, it was used during manufacturing processes – one widespread use was to make products resistant to water, grease or stains, such as carpets, clothing, furniture fabrics, paper packaging for food, and cookware.

PFOS is classed as a persistent organic pollutant (POP) under the Stockholm Convention, an international agreement on managing POPs to protect human health and the environment. POPs are stable compounds that do not readily break down through chemical or biological processes: they persist for a long time, both in the environment and in the human body with potential effects on health.

The use of PFOA, another PFAS chemical, is already restricted by many countries. PFOA is expected to be listed as a POP under the Stockholm Convention in the near future.

PFOS foams were restricted in New Zealand in 2006 when they were excluded from the Firefighting Chemicals Group Standard. This meant no more PFOS foams could be imported into New Zealand, or manufactured here.

Countries that ratified the Stockholm Convention have agreed that POPs should be disposed of in an environmentally-sound manner (often by high-temperature incineration). In New Zealand, material containing or contaminated with higher concentrations of PFOS must be exported for disposal because, currently, there is no in-country facility to dispose of POPs.

See the Alerts page of our website for more guidance about disposing of PFOS-containing firefighting foams

PFOS: International and New Zealand regulation

International events and agreements		New Zealand law
Foams containing PFOS were used internationally, including for training purposes, because they were the most effective means of extinguishing highly volatile liquid fuel fires.	1960s to 1990s	
	1996	New Zealand Hazardous Substances and New Organisms (HSNO) Act (into effect in 2001 for hazardous substances)
Stockholm Convention on POPs banned production and use of some of the most toxic chemicals.	2001	New Zealand signed Stockholm Convention May 2001
3M stopped manufacturing foams containing PFOS, although some countries may continue to manufacture PFOS foam	2002	
Stockholm Convention on POPS came into force in May 2004.	2004	September: Stockholm Convention ratified by New Zealand; December: added into the HSNO Act
	2006	PFOS foams were restricted in New Zealand by being excluded from the Firefighting Chemicals Group Standard[1]. This meant that no more PFOS foams could be imported or manufactured here.
Norway prohibits manufacturing and import of PFOS above 0.005% (50 ppm)	2007	
Canada publishes regulations restricting PFOS	2008	
PFOS was listed as a POP under the Stockholm Convention, coming into effect in 2010	2009 2010	
The EU prohibits the use of PFOS	2011	The Stockholm decision on PFOS was written into New Zealand domestic law. Under the HSNO Act substances containing PFOS were recognised as POPs. This meant, in addition to the 2006 restriction, any existing PFOS-containing products could not be used, and strict controls were set to manage their storage and disposal.
Foams containing derivatives of PFOA stopped being widely manufactured in western countries. (They may contain trace quantities of PFOA as an unavoidable by-product of the manufacturing process.)	2016	
Queensland introduces policy to ban use of firefighting foams containing PFOS and PFOA	2016	
	2017	1 December: HSNO Act was amended, giving the EPA new powers to enforce the requirement for hazardous substances to have an approval, and the prohibitions and requirements relating to POPs.
South Australia bans PFAS containing firefighting foams	2018	
PFOA, another PFAS chemical, is expected to be listed as a POP under the Stockholm Convention	2019	

Strategy for the investigation

12. Operations of this nature involve these stages:
    - defining the scope and allocating the available resources
    - investigation and evidence-gathering
    - decision-making on the compliance approach to be taken
    - enforcement, where necessary
    - follow-up
13. Figure 1 shows these stages across the duration of this investigation, with key evidence-gathering steps and decisions.
14. To be successful, we needed to:
    - identify where firefighting foams containing PFOS were used or stored in New Zealand
    - identify any non-compliance with obligations under the HSNO Act
    - change the behaviour of those who were non-compliant (using statutory enforcement powers as or where appropriate)
    - report on the findings of the investigation
    - remain vigilant with planned future follow up action.

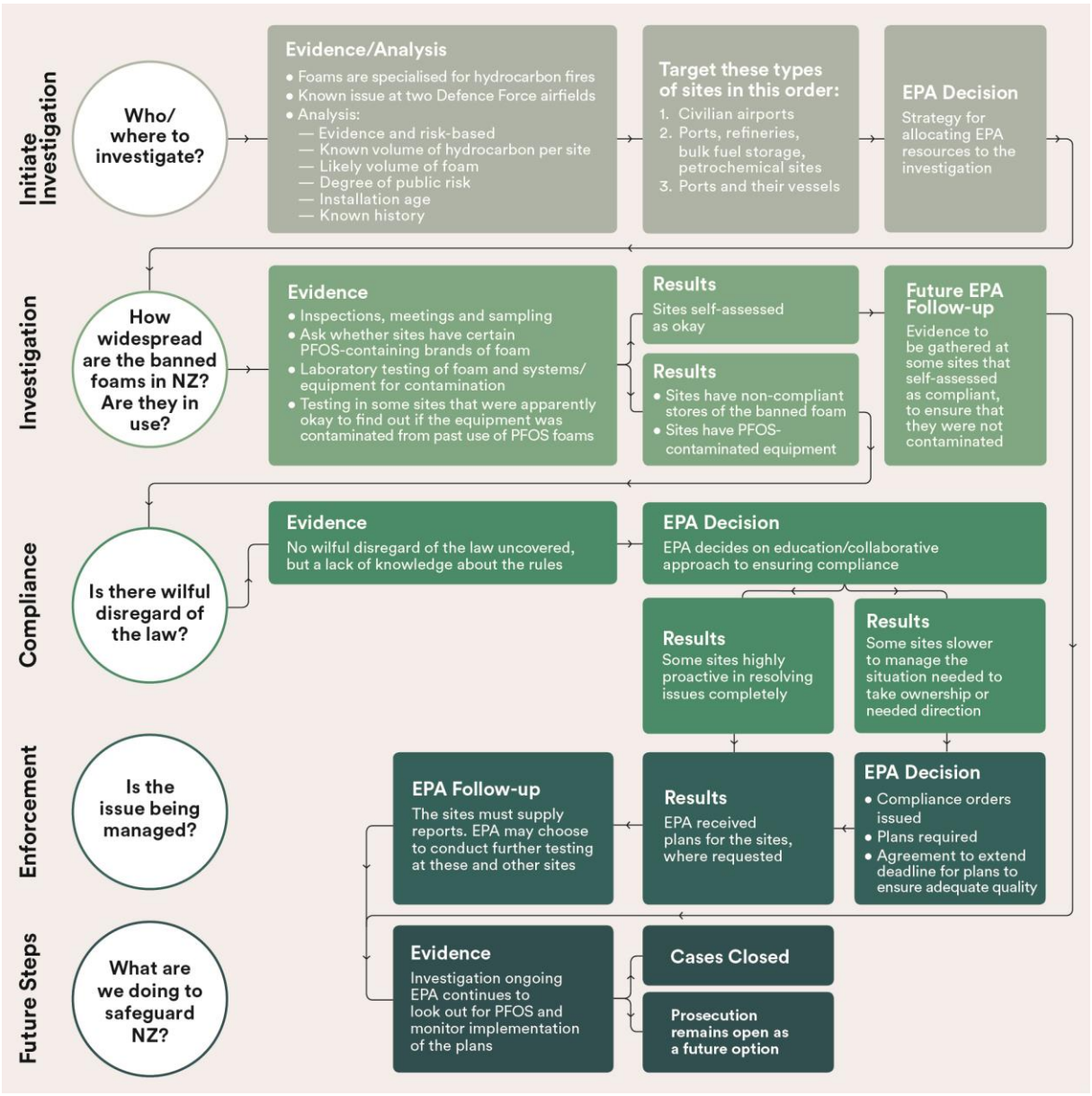
Resources

15. A dedicated investigation team of eight EPA staff, including HSNO-warranted enforcement officers and legal support, was set up and an investigations expert was hired to lead the team.
16. A governance group of three members of the Executive Leadership team, including the EPA General Counsel, plus the EPA Principal Scientist, the investigations expert, and senior members of the Legal and Communications team met weekly. This group kept an overview of the investigation and approved some of the compliance and enforcement actions. They were independent from the investigation team.
17. The EPA Communications team worked to keep the public informed about progress during the investigation (see Appendix 1).

Scope of our role

18. The scope of our investigation was:
    - to determine the extent to which PFOS-containing foams had been imported, manufactured, used, stored and disposed of across New Zealand, in contravention to any HSNO Act 1996 requirements
    - in the event of finding such foam, determining an approved and safe way to remove and dispose of the foam.
19. We considered that public interest was best served by ensuring that any non-compliant foams were stored correctly, and that there was a plan for their disposal. (This was particularly important as, in most cases, it required those under investigation to engage with experts to understand the steps to be taken for safe decontamination and disposal.)

Figure 1 **Questions addressed, evidence collected and EPA decisions as the investigation progressed**



Identifying where to investigate

20. Firefighting foams containing PFOS were developed specifically for fires involving hydrocarbon fuels.
21. The initial focus of the investigation was on New Zealand airports. This sector was chosen because the New Zealand Defence Force sites at which PFOS contamination were discovered were airbases.
22. Commercial airports were prioritised because they are likely to hold large volumes of these specialist foams.
23. Prior to announcing our investigation, we made preliminary enquiries by e-mail to establish which firefighting foams were in use at 14 commercial airports in New Zealand. These were larger airports with their own dedicated firefighting resources.
24. As a result of the preliminary enquiries, a broader investigation plan was developed, including the listing and analysis of possible offences, relevant legislative history, and primary issues to be considered. This plan was approved by EPA Chief Executive Dr Allan Freeth.
25. After completing the initial review of 14 commercial airports, our investigators looked at all other smaller airports in New Zealand, including the Chatham Islands (an additional 19 airports).
26. We then used a standard evidence and risk-based approach to identify and prioritise other sites from sector groups across New Zealand that may have possessed, used or stored PFOS foams. Each sector group was assessed against risk criteria:
    - volume of firefighting foam they were likely to hold
    - sector size
    - public risk
    - our knowledge of the sector and its history.
27. To further supplement the risk criteria, sub-criteria were used to indicate the volumes of firefighting foam, and in turn, the likelihood of the PFOS foam volume being significant. These were:
    - the volume of hydrocarbons stored
    - age of installations.
28. Based on the risk assessment, hazardous storage areas such as ports, refineries and bulk fuel storage, and petrochemical sites were considered the next priority. These formed stage two of the investigation and included 108 sites.
29. The risk-assessment approach showed that the investigation's next priority sector was 15 New Zealand-registered ships and shipping companies. This was stage three of the investigation.

Definition of the ‘use’ of foam

30. The definition of ‘use’ of a PFOS-contaminated foam includes foam that is stored in equipment, such as fire trucks or firefighting systems, or in containers, so that it is available for immediate deployment in an emergency.

31. Note that where PFOS-contaminated foam was unable to be replaced immediately (for example, for public safely in the event of an air crash), we allowed organisations to keep it in place, until the foam could be replaced.

Definition of compliance

32. Anyone in possession of POP chemicals must follow the rules in the Hazardous Substances (Storage and Disposal of Persistent Organic Pollutants) Notice 2004, so they must:
    - store them in suitable containers
    - keep those containers in buildings and places that are secure and suitable (taking account of the quantity)
    - ensure the risk of contamination to people, crops, animals and the environment is minimised
    - dispose of them using a method that changes the characteristics or composition of the substance so that the substance or any product of such treatment is no longer a persistent organic pollutant and is not a hazardous substance (e.g. high-temperature incineration), or by exporting the substance from New Zealand as waste for environmentally-sound disposal, provided that such export complies with the relevant requirements of the Basel Convention.

Our compliance approach

33. The investigation used the internationally-recognised industry-standard Voluntary, Assisted, Directed, and Enforced (VADE) model for such operations – Figure 2 below.

34. This model presents a continuum of approaches, ranging from: assistance for those who want to do the right thing but don't always succeed, through to enforcing with the full force of the law for wilful illegal behaviour.

35. The aim of the investigation was to secure the best outcome by working with parties, either on a voluntary basis or via a compliance order, to ensure they took the necessary steps for decontamination and disposal in accordance with technical standards.

36. A 'black-and-white, full force of the law' response (such as prosecution) is not considered best practice in the context of addressing the reasons behind non-compliance, particularly where those under investigation indicated their willingness to comply, and where we have subsequently verified that they have complied.

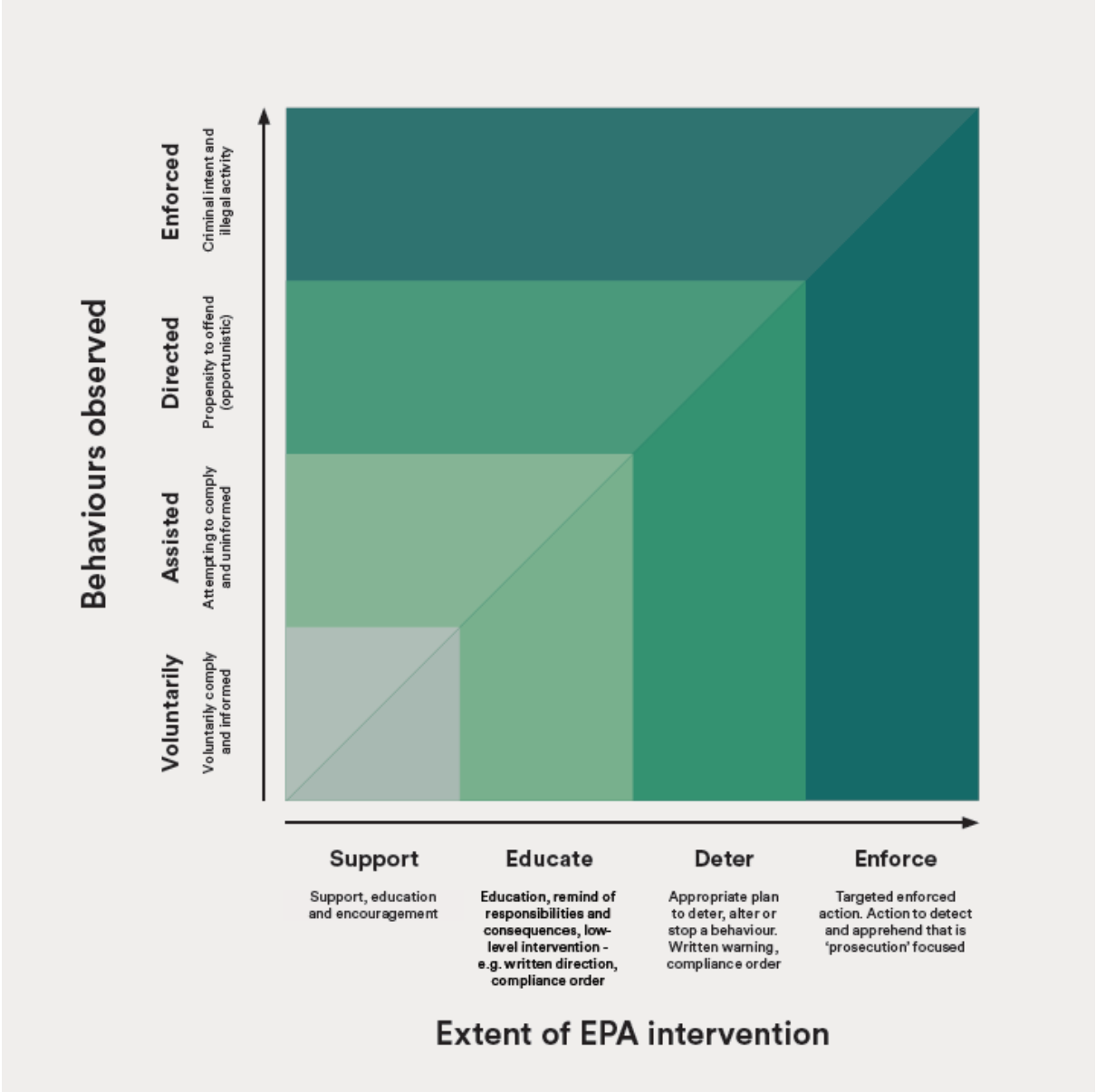
37. This model aligns with our compliance approach for identifying and carrying out regulatory intervention: *EPA Compliance: Our Approach*.

38. In addition, the EPA considered the following factors to guide its choice of enforcement action:
    - the extent of harm or risk of harm to the public and the environment
    - the conduct and compliance history of the person or business
    - attitude to compliance – the general attitude (or level of willingness) to be compliant.

Enforcement actions available to us

39. The direct enforcement actions available to us for any breaches uncovered were limited to:
    - warning letters
    - compliance orders
    - prosecution, or prosecution following breach of a compliance order.

Figure 2 **The VADE (Voluntary, Assisted, Directed, Enforced) compliance model is based on changing behaviours with a risk-based approach (allows prioritisation of activities based on analysis of data on hand). The model is used across government in New Zealand. Simplified, the VADE compliance model is:**



Carrying out the investigation

Collection of evidence

40. Our investigators sought a list of foams (including expired and/or out-of-service products) by brand name and type, currently in use or in storage. They particularly sought information on *3M Light Water* products from which they could determine if the foam contained PFOS.

41. Meetings were held at the various locations with between three and six attendees. There were always two HSNO-warranted EPA enforcement officers present. The meetings were digitally recorded (at all sites except Nelson) with the consent of all parties. Some meetings required a follow-up with letters requesting further information (under the authority of section 103A of the HSNO Act).

42. Premises and facilities were inspected following the meetings. These inspections included sampling the firefighting foam under strict protocols to prevent cross-contamination and to protect the integrity of the chain of custody. An 'A' sample and a 'B' sample were collected from each selected area or container. 'A' samples were sent to AsureQuality, Wellington, for a Certificate of Analysis for the presence of PFOS, PFOA and other PFAS compounds. 'B' samples were kept intact in case the company requested a second test. Further testing was not requested during the investigation.

43. Allegations and issues to be investigated were recorded, along with the investigation strategy, possible sources of evidence, and available resources.

Sites where the PFOS in firefighting foam was discovered

Stage One: Airports

44. Of the 14 airports approached initially (Appendix 2, Table 1), the following confirmed that they held non-compliant firefighting foam (*3M Light Water*):
    - Gisborne
    - Nelson
    - Palmerston North
    - Hawkes Bay

45. We undertook physical inspections of these four airports as a priority; meetings were organised, equipment examined and samples taken.

46. Later testing showed PFOS contamination in foams at another three airports. Two airports had low levels of contamination in foam in two fire trucks each; the other had a low level of contamination in redundant foam in storage (Appendix 2, Table 1a).

47. Of the remaining 19 airports investigated (Appendix 2, Table 1b), two confirmed that they held non-compliant firefighting foam (*3M Light Water* - redundant foam in storage):
    - Kapiti Coast
    - Chatham Islands

48. Throughout the investigation, ten commercial airports out of the 34 airports were physically inspected. Compliance at other sites was confirmed by obtaining lists of brand names of foams at these airports, photos of their labels, and copies of safety data sheets (manufacturers' technical information about the foams). The foam at Hamilton airport was sampled and tested directly, showing that the foam was compliant.

Stage Two: Ports, refineries and bulk fuel storage, and petrochemical sites

49. Three of the 108 sites investigated confirmed that they held PFOS-containing foam (Appendix 2, Table 2). All were controlled by Shell Taranaki Ltd in New Plymouth.

50. These were:
    - Paritutu tank farm (a single tank on one site)
    - Energy and Infrastructure Ltd (a tank storage shed)
    - T3500 tank farm (one of multiple tanks all served by a single fixed foam firefighting system).

51. A low level of PFOS contamination near to the compliance threshold was also observed in a fourth Shell Taranaki Ltd site (Appendix 2, Table 2).

Stage Three: New Zealand-registered ships and shipping companies

52. Two of the New Zealand-registered ships and shipping companies that were investigated held non-compliant foam (Appendix 2, Table 3):
    - Marine Services Auckland Ltd (on the vessel: MV Maui 1)
    - Lyttelton Port Company (on the vessel: MV Purau)

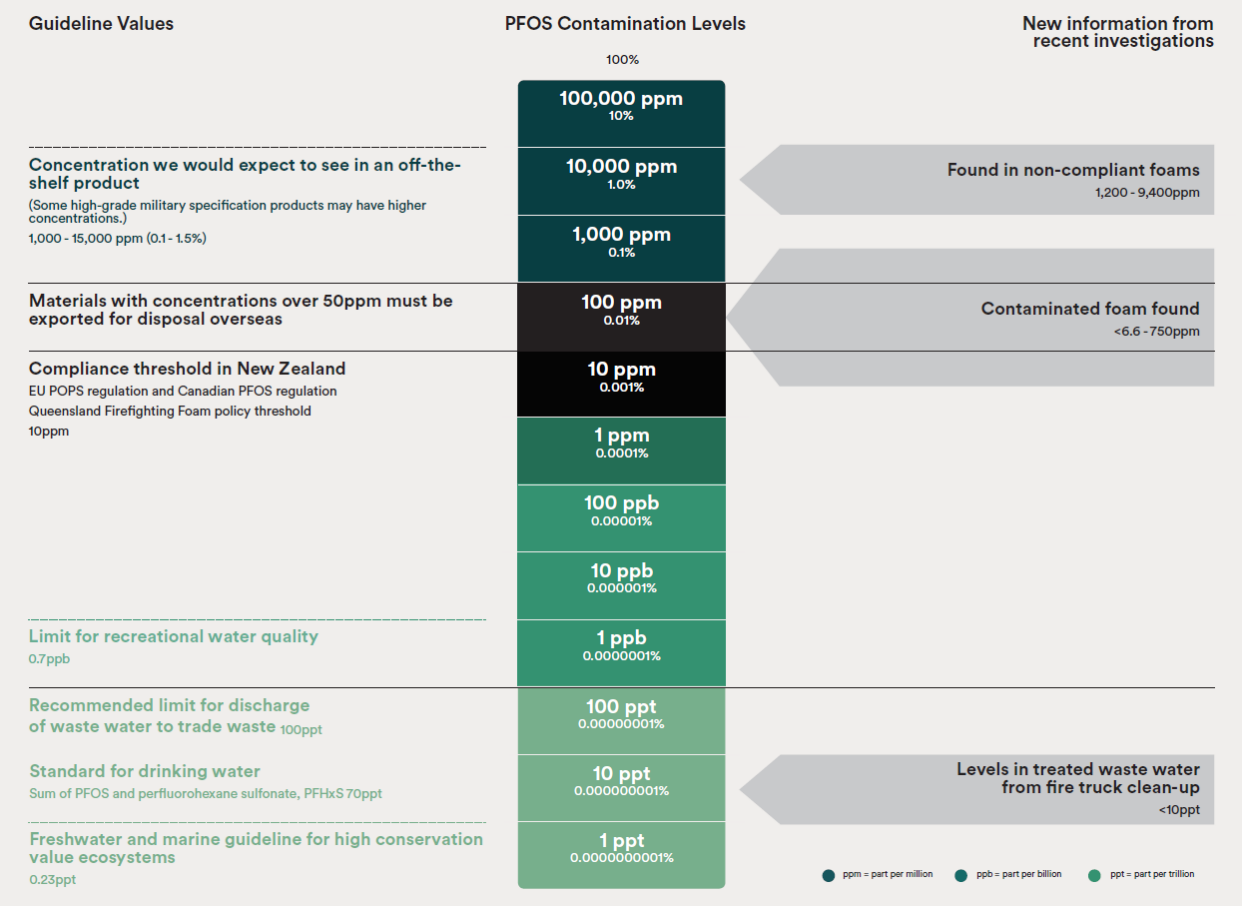
Observations

53. In all instances where PFOS firefighting foam was identified, our investigation found no evidence that anyone had imported it after 2006.

54. Where foams were found to contain PFOS at levels that indicated contamination had occurred (such as, by contact or mixing of a non-PFOS foam with PFOS foam), there were considerable challenges around establishing exactly when that contamination had occurred. In these instances, it was also considered reasonably likely that contamination was via PFOS foam that had been imported before 2006.

55. An overview of the concentrations of PFOS discovered, against guideline values is shown in Figure 3.

Figure 3 **Information on concentrations of PFOS in firefighting foams found during the investigation**



Compliance and enforcement

56. Each site was assessed for its ability to return to compliance. This assessment also determined the most appropriate compliance method to use, ranging from Compliance Orders through to requiring periodic progress updates.
57. The investigation invoked our powers of entry for inspection and requiring the production of documents 34 times (these are listed under section 103A of the HSNO Act 1996).
58. No charging documents were filed with the District Court for prosecution of any party, and no warning letters relating to breaches of the HSNO Act and regulations were sent to any sites. This reflects the overall strong desire by those involved to attempt to comply with the HSNO Act obligations.
59. Compliance orders were issued early in the investigation, as discussed, to show the seriousness of the public and environmental issues from the use of these foams. The later compliance order addressed reluctance by an organisation to face the issue.
60. Compliance orders set out clear actions that are required to resolve a particular issue. These were issued so that there would be no misunderstanding what was required to rectify the non-compliance. It is an offence not to comply with a compliance order.
61. We served four compliance orders under section 104 of the HSNO Act:
    - Nelson Airport Fire Service Limited – 27 February 2018
    - Nelson Airport Limited – 27 February 2018
    - Task Protection Services Limited (the company owning and controlling the fire trucks, equipment, containers and foam at Gisborne, Hawke's Bay, and Palmerston North airports) – 12 March 2018
    - Lyttleton Port Company (LPC) - 14 January 2019
62. All of the compliance orders stated why they were issued, backed up by the information gathered through meetings and chemical testing, and setting out that the airport or entity was in contravention of the HSNO Act because it is illegal for anyone to use or store a persistent organic pollutant such as PFOS.
63. Compliance orders were served on Nelson Airport Ltd and Nelson Airport Fire Service Ltd as separate entities. This was because fire trucks containing non-compliant foam were owned by both. Both fire trucks were based at the fire station at Nelson airport.
64. We do not rule out issuing more compliance orders in the future, if they are needed.
65. Each entity was specifically advised of the actions required of it:

    I. To stop using firefighting foam containing PFOS (allowances were made for use in emergencies, if necessary).

    II. To get technical advice from experts, approved by the EPA, and in the form of a written plan, about steps to be taken to discontinue the use of PFOS foams, and to safely remove, transport, and dispose of them in accordance with the HSNO Act.

III. To submit action plans to the EPA for approval, outlining:

   a. arrangements for disposal of the foam, and associated containers

   b. how any firefighting trucks, or aircraft hangars that held PFOS foam, were to be cleaned to a standard that prevented recontamination of any replacement firefighting foams

   c. how any PFOS-contaminated water that had been used to wash out equipment, would be stored and disposed of

   d. how any PFOS-contaminated containers would be stored and disposed of.

66. Once submitted plans were agreed with us, the EPA, time limits were set with dates initially agreed by all parties on when and how the foams were to be removed, transported, and disposed of.

67. Nelson Airport Ltd and Nelson Airport Fire Service Ltd submitted their final plans to investigators in September 2018. Task Protection Services Limited submitted its final plan in November 2018. An agreed plan has been received from the Lyttelton Port Company. This is an ongoing investigation and other plans may be delivered if they are required.

68. We considered that compliance orders were the most appropriate enforcement action. No other offences under other legislation were apparent and, therefore, prosecution or enforcement under other legislation was not considered.

Outcome

69. The deadlines set in the compliance orders in February and March 2018 proved too tight. They were extended by mutual agreement. Negotiations continued to ensure the plans presented to investigators were suitable for implementation.

70. Plans were developed on the basis that the parties continued to have legal responsibility for complying with the law, achieved through execution of their plan. Our investigators took steps to gain assurance that the plans provided an appropriate level of detail and expert technical input.

71. Reaching an agreed final plan was protracted because of the highly technical nature of the work, (reflecting the challenges of cleaning out fire trucks); the need for parties to retain appropriate expertise; and logistical challenges.

72. We continue to monitor the implementation of the plans submitted to us under compliance orders during our ongoing investigation, and we will follow up, as is needed.

73. In all cases where PFOS was discovered, the parties took our direction, and complied with legal storage and labelling obligations. At the time of writing:
    - we have received and approved applications for export permits for the environmentally-sound disposal of the foam (at high concentrations of PFOS, disposal involves export for high-temperature incineration, to meet New Zealand's international obligations)
    - the PFOS foam from Kapiti airport has been exported for environmentally-sound disposal
    - eight organisations have completed the removal and/or clean-up of their equipment, and their PFOS materials were collected and are pending disposal (Nelson, Hawkes Bay, Palmerston North, New Plymouth, and Chatham Islands airports, Nelson Airport Fire Services Ltd, Auckland International Airport and Air New Zealand Auckland hangar); the rinsate (rinsing water) from Nelson Airport Fire Services Ltd, Nelson airport, Air New Zealand Auckland hangar and New Plymouth was treated and decontaminated on site, tested and disposed of according to local council trade waste rules
    - Shell Taranaki Ltd has decontaminated and removed their PFOS materials from four sites into safe storage at one site, including the rinsate
    - Gisborne airport is scheduled for decontamination on 10–13 April 2019
    - Queenstown airport, Marine Services Auckland Ltd, Lyttelton Port Company Ltd and TRS Tyres Ltd are actively working with environmental consultants to manage their sites.
74. Because of the protracted nature of the steps that sometimes have to be taken, we cannot yet verify that full HSNO compliance has been achieved in all cases. Nonetheless, we consider substantial compliance has been achieved, and our investigators remain vigilant and will follow up for verification, where needed.
75. No prosecutions were made. We considered a prosecution approach was not needed in the context of addressing the reasons behind non-compliance at the various sites, particularly where those under investigation demonstrated that they were willing to comply.

Next steps

76. The EPA continues to work towards ensuring PFOS foams are removed and disposed of in an approved and safe way, leaving the New Zealand environment free from the threat of future contamination.

Compliance and enforcement

77. It is possible that further PFOS-containing firefighting foam will be discovered at sites around the country. As well as proactively inspecting for persistent organic pollutants during planned hazardous substances inspections, we also respond to any new and relevant information. For example, we were informed about PFOS-containing foam at the TRS tyres site in Whanganui in November 2018, and disposal is being managed in accordance with this approach.

78. Our investigation has now moved to a 'trust and verify' phase. This will involve visiting sites from a cross-section of sectors. During the visits, firefighting foam is being tested to confirm the absence of PFOS. For example, in the shipping sector, Strait Shipping's M.V. Strait Feronia, and the tank-farm sector's Mobil, Wellington tank farm, were both sampled and tested negative for PFOS.

Review of regulatory tools

79. As a result of the investigation, we are undertaking some work to ensure that the rules relevant to firefighting foams and persistent organic pollutants provide clarity and reflect:
    - expanding scientific knowledge
    - implications of the Health and Safety at Work Act 2015, and
    - recent developments internationally in the regulation of firefighting foams such as the changes to the Stockholm Convention.

80. These rules include:
    - the *Fire Fighting Chemicals Group Standard 2017*
    - the *Hazardous Substances (Storage and Disposal of Persistent Organic Pollutants) Notice 2004*.

81. It is expected that consultation documents will be issued later this year.

On prosecution

82. It was our firm belief that prosecution would not necessarily have achieved the best outcomes in terms of timeliness or moving towards compliance.

83. In considering prosecution, the EPA referred to the VADE model and to *EPA Compliance: Our Approach*, which states the test for prosecution is met if:
    - the evidence which can be presented in Court is sufficient to provide a reasonable prospect of conviction (the Evidential test[9]), and
    - prosecution is required in the public interest (the Public Interest test[10]).

84. We could meet the criteria for the Evidential test, but did not consider it in the Public Interest to pursue prosecution of non-compliance.

85. This decision during the course of this investigation does not rule out prosecution in the future, if it is warranted.

Conclusions

86. We consider that we met the objectives of our investigation and, while no prosecutions were undertaken, enforcement and compliance actions were successful.

87. The investigation uncovered PFOS-containing firefighting foam at various sites across New Zealand. This was predominantly either the *3M Light Water* brand of foam, or foam that had been contaminated with previously-used *3M Light Water*.

88. No intentional non-compliance was discovered. Several times, we reminded entities of their legal obligations regarding the storage of persistent organic pollutants following the New Zealand law change in August 2011. Education and advice was considered the most appropriate approach to compliance.

89. In all cases, the relevant entities took our advice, and complied with our storage and labelling obligations.

90. There were no instances where the EPA found that a non-complying person or organisation deliberately offended against the HSNO Act. No blatant illegal activities with criminal intent were revealed. In all of the instances where PFOS firefighting foam was identified, we concluded it was highly likely the foam had been imported prior to 2006, when importation was legal. Where contaminated foams were found, there were considerable challenges around establishing exactly when that contamination occurred. In these instances, we concluded it was reasonably likely that contamination was via PFOS foam that had been imported before 2006.

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[9]The Evidential test was considered to be capable of being met due to the existence of: an identifiable individual, credible evidence that is beyond reasonable doubt, evidence which the prosecution can adduce, there is an objectively reasonable prospect of a conviction, and the commission of a criminal offence.

[10] The Public Interest test is more multi-faceted than the Evidential test and involves considerations ranging from the seriousness of the offence, whether there are grounds for believing the offence will be repeated or causes a serious risk of harm or financial loss, previous convictions or cautions, premeditation, through to abuse of trust or authority and any element of corruption.

91. Our investigators worked with all affected parties to resolve the issue. An aim of the investigation was to secure the best outcome by working with parties, either on a voluntary basis or via a compliance order, to ensure they took the necessary steps for decontamination and disposal in line with technical standards.
92. Three compliance orders were issued early in the investigation to show the seriousness of the public and environmental issues arising from the use of these foams (Nelson Airport Fire Service Ltd, Nelson Airport and Task Protection Services Ltd). A later compliance order served to Lyttelton Port Company addressed their reluctance to face the issue.
93. We do not rule out issuing further compliance orders, if they are needed.
94. We expect that there will be enduring behavioural change for the better regarding PFAS chemicals being achieved through the approach undertaken as a result of this investigation.
95. The presence of PFOS in foams in firefighting trucks, firefighting systems in tug boats, deluge firefighting systems at tank farms, and aircraft hangars, can sometimes require complex and protracted steps to achieve decontamination. Because of the protracted nature of the steps that sometimes have to be taken, the investigation cannot yet verify that full HSNO Act compliance has been achieved in all cases. Nonetheless, we consider substantial compliance has been achieved, and that we are able to characterise our future work as ‘follow-up verification’.
96. We will continue to monitor companies that responded to our requests for information on PFOS-containing foam. Our observations will focus on monitoring the removal of PFOS-containing foam and verifying the absence of PFOS-containing foam for sites that reported no holdings of PFOS-containing foams.
97. It was our firm belief that prosecution would not necessarily have achieved the best outcomes in terms of timeliness or moving towards compliance, but this does not rule out prosecution in the future, if it is warranted.

Appendix 1 Public interest and communications

Our investigation was conducted against a backdrop of public concern about the emerging contamination issues. We issued a number of media releases, and our statements and interviews were covered by print and broadcast media. A significant number of Official Information Act requests on PFAS-related issues were also received. On 7 December 2017, the Minister for the Environment issued a media statement noting that Government agencies were investigating potential water contamination around the Ohakea and Woodbourne airbases, because levels of PFOS and PFOA in groundwater were above drinking water guideline levels.

On 20 December 2017, we issued a media release announcing our investigation into firefighting foams manufactured using PFOS, that were held or being used at airports and other locations. The release explained that we thought it appropriate to let the public know of the investigation, given that information was already in the public domain, and that there was considerable public interest in the issue. It concluded by noting we did not intend to comment further as the investigation proceeded, but would report on the outcome of our enquiries as soon as practicable.

On 8 January 2018, we issued information on our website about firefighting foams, advising that anyone using or storing such products needed to comply with our Fire Fighting Chemicals Group Standards of 2006 and 2017. Links to these standards were provided. It was also noted that wall-mounted, hand-held fire extinguishers commonly found in the home, were unaffected, as they are not manufactured using PFOS. Links were provided to information about the nature of PFOS, and how it is regulated in New Zealand.

On 15 February 2018, we issued a media statement describing preparations for our investigation. This noted that a specialist team had been assembled, an experienced lead investigator appointed, an investigation plan developed, and preliminary discussions held to scope the potential scale of the issue. We emphasised that our overall aim was to ensure all organisations and individuals comply with their legal obligations. An ancillary aim of the release was to reassure the public that the issue was being addressed, given the initial announcement had been made two months previously.

On 27 February 2018, we announced that our team had served compliance orders relating to Nelson Airport, following inspection of its firefighting facilities, as part of our firefighting foams investigation. This media release noted that an independent, qualified laboratory had tested foam samples from the airport, and some had tested positive for PFOS. The release explained that the compliance order required the airport to stop using the foam when responding to emergencies “as soon as practicable”. The airport was also required to submit a plan to us at the EPA, detailing steps that would be taken to ensure the non-compliant foam was no longer being used for training or testing purposes, and how it would be safely stored and disposed of.

Subsequently, on 1 March 2018, we issued a media release urging airports to plan for rapid phase-out of dangerous firefighting foams. This urged all airports and fuel-based facilities to check their stocks, and if non-compliant foam was identified, to begin planning its phase-out straight away, and to discuss their plans with us. We noted the process might take some time, given the need to source alternative foam, and clean fire trucks and other equipment. But we urged immediate action in the interests of

environmental and human safety, rather than waiting for samples to be taken and laboratory results processed.

On 12 March 2018, we issued a media release announcing we had served a compliance order on Task Protection Services Ltd, based on the conclusion that non-compliant foams were present in drums and/or fire trucks at Palmerston North, Gisborne, and Hawkes Bay Airports. The release noted that Task Protection Services Ltd owned and controlled this equipment and foam, and that the compliance order required the company to stop using the non-compliant foam when responding to emergencies by a specified date. Other conditions were also described in the release.

The public statements relating to the four compliance orders issued were made only after the Orders had been served, that is, after the investigative work had concluded.

On 25 July 2018, we issued a brief general update on our investigation. This noted that PFOS-containing foams had been found at various sites, and ranged from small amounts held in storage, to a few instances of larger volumes kept for emergency use. We noted that in the latter cases, safe disposal included the need to decontaminate equipment and facilities.

We consider that it is appropriate to issue this report now, while acknowledging that some parties still have steps to take to fully meet their compliance obligations. We recognise the significant public interest in matters to do with PFOS-containing firefighting foams, and believe it is important to share our main conclusions with the public at this stage.

Guidance published

In addition to our public statements, we published three alerts on our website to provide guidance to organisations dealing with PFOS foams:

Managing firefighting foams manufactured with PFAS chemicals included a reminder about our investigation and background information, and advised that such foams should be managed in line with the Fire Fighting Chemicals Group Standard 2017.

Please check to see if you have 3M Light Water fire-fighting foam contained a reminder to check foam stocks for their brand and date of manufacture.

How to dispose of fire-fighting foams containing PFOS explained obligations for planning, managing and disposing of firefighting foams containing PFOS.

Appendix 2 Sites included in the investigation

Table 1 (a) Initial survey of major airports with dedicated firefighting facilities showing where PFOS-containing foam was identified

Fourteen sites were approached and PFOS-containing foam was uncovered at the sites below. During this time, our investigation also found that there is no PFOS-containing foam at Christchurch, Dunedin, Hamilton, Invercargill, Rotorua and Wellington airports. This was confirmed by obtaining lists of brand names of foams at these airports, photos of their labels, and copies of safety data sheets (manufacturers' technical information about the foams). The foam at Hamilton airport was sampled and tested directly, showing that the foam was compliant.

Operator	Site	Non-compliant material on site?	Amount (litres)	Concentration and notes	Status of foam as of March 2019
Task Protection Services Ltd	Hawke's Bay Airport, Napier	3M PFOS foam	1,600	Fire truck: 0.55% (5,500 ppm) Drums: 0.54% (5,400 ppm), 0.15% (1,500 ppm)	Appliances decontaminated; all foam and rinsate removed from site and pending overseas disposal
Task Protection Services Ltd	Palmerston North Airport, Manawatu-Whanganui	3M PFOS foam and some levels of contamination	2,400	Fire trucks: 0.54% (5,400 ppm), 0.012% (120 ppm) Drums: 0.35% (3,500 ppm), 0.34% (3,400 ppm)	Appliances decontaminated; all foam and rinsate removed from site and pending overseas disposal
Task Protection Services Ltd	Gisborne Airport, Gisborne	3M PFOS foam and some levels of contamination	600	Fire truck: 0.48% (4,800 ppm) Drums: 0.43% (4,300 ppm), 0.069% (690 ppm), 0.075% (750 ppm)	Decontamination scheduled for 10–13 April 2019
Nelson Airport Ltd & Nelson Airport Fire Services Ltd	Nelson Airport, Nelson-Tasman	3M PFOS foam	1,280	Trailer and drum: 0.32% (3,200 ppm) Trucks: 0.18% (1,800 ppm), 0.31% (3,100 ppm)	Decontamination complete; all foam concentrate removed from site and pending overseas disposal; rinsate treated on site, tested and released
Queenstown Airport		Foam in two fire trucks was found to be contaminated with low levels of PFOS	Quantity in truck	Fire trucks: 0.056% (560 ppm), 0.039% (390 ppm)	Actively working with environmental consultants to manage their site
New Plymouth Airport, Taranaki		Foam in fire trucks was found to be contaminated with low levels of PFOS	350	Fire trucks: 0.034% (340 ppm), 0.0021% (21 ppm)	All firefighting appliances have been decontaminated. EPA awaiting final report from airport.

Table 1 (a) continued

Operator	Site	Non-compliant material on site?	Amount (litres)	Concentration and notes	Status of foam as of March 2019
AIAL	Auckland Airport, Auckland	A low level of contamination found in redundant foam which was already removed from operation and was in storage	10,400	Foam in storage and already removed from operation: 0.026% (260 ppm)	PFOS materials removed from site and pending overseas disposal.
Tauranga Airport, Bay of Plenty		This airport approached us to let us know they had detected very low concentrations, well below the compliance threshold			

Table 1 (b) Survey of all other New Zealand airports: PFOS-containing foam found at two more sites

At a further 19 airport sites, the investigation team took the same evidence-based approach as in Table 1 (a). Two sites (below) reported 3M PFOS foam on site. PFOS-containing foam was not discovered at the following airports: Ardmore (Auckland), Hokitika, Kaitaia, Kerikeri, Masterton, Matamata, Milford Sounds, Motueka, Rangiora, Takaka, Taupo, Timaru, Wairoa, Westport, Whakatane, Whanganui and Whangarei.

Operator	Site	Non-compliant material on site?	Amount (litres)	Concentration and notes	Status of foam as of March 2019
Chatham Islands Enterprise Trust	Chatham Islands Airport	3M PFOS foam	400	Not tested as it was reported as labelled, off-the-shelf *3M Light Water*	PFOS materials collected from site and pending overseas disposal
Kapiti Coast Airport, Wellington		3M PFOS foam	40	Not tested as reported as labelled, off-the-shelf *3M Light Water*	PFOS materials have been exported for disposal

Table 2 Sites with PFOS foams in industry involving fuel production, storage, supply and transport

These sites included ports, refineries and bulk fuel storage, and petrochemical sites. PFOS-containing foam was not discovered at sites belonging to: Air Liquid New Zealand Ltd (3 sites), Airbus New Zealand Ltd (formerly SafeAir), Beach Energy Resources NZ (Kupe) Ltd (2 sites), BP Oil New Zealand Ltd, Bulk Storage Terminals Ltd (4 sites), Canterbury Aero Club, Chempro NZ Ltd (3 sites), Christchurch Helicopters, CentrePort Ltd, Chemcourier Services Ltd (part of Mainfreight), Chemfreight Ltd (3 sites), Contact Energy Ltd (10 sites), Eastland Community Trust, Elgas Ltd (4 sites), Fonterra & Lactanol Ltd, Lyttelton Port Company Ltd (2 onshore sites, see Table 3 for vessels), M&O Pacific Ltd, Methanex New Zealand (5 sites), Mobil Oil New Zealand Ltd (8 sites), New Zealand Oil Services Limited (13 sites), North Tugz ltd, Northport ltd, Op Deep Freeze base, the ports of Marlborough, Nelson, Napier, Tauranga, Otago, Taranaki (3 sites) and Auckland, PrimePort Timaru Ltd, South Port NZ Ltd, Stolthaven New Zealand Ltd, Terminals (NZ) Ltd, The New Zealand Refining Company Ltd, Timaru Oil Services Ltd, Wiri Oil Services ltd (2 sites), Z Energy Ltd (9 sites).

Operator	Site	Non-compliant firefighting foam?	Amount (litres)	Concentration and notes	Status of foam as of March 2019
Shell Taranaki Ltd	Support Facility, Omata, New Plymouth	3M PFOS foam	19,000	Bulk containers: 0.38% (3,800 ppm) and 0.34% (3,400 ppm)	Bulk containers all removed from site to a dedicated storage facility, pending disposal overseas. Currently holding rinsate (rinsing water) from all Shell sites.
	T3500 Tank Farm, Omata, New Plymouth, Taranaki	3M PFOS foam	2,000	Foam in tank 0.34% (3,400 ppm)	All equipment decontaminated, foam removed from site to a dedicated storage facility, pending disposal overseas.
	Paritutu Tank Farm, Omata, New Plymouth, Taranaki	3M PFOS foam	2,758	Foam in tank: 0.32% (3,200 ppm)	
	EIL Tank Farm, Omata, New Plymouth, Taranaki	Low level of PFOS contamination near compliance threshold	1,400	Tank contamination: 6.6ppm and 12ppm	
	Pohokura Production Station, Main North Road, North of Waitara	No			Not applicable
	Maui Production Station, Tai Road, Oaonui	No			Not applicable
TRS Tyres	Whanganui	3M PFOS foam	200	Drum: 0.07% (700 ppm)	EPA assessing management plan to deal with issue
Air New Zealand	Hangar, Auckland Airport, Auckland	Contamination observed	28,000 in tanks plus 9,000 of foam solution	Foam in tanks 0.022% (220 ppm) plus other less contaminated foam solution	PFOS materials collected from site and pending overseas disposal
	Hangar, Nelson Airport, Nelson	No			Not applicable
	Hangar, Christchurch Airport, Canterbury	No			Not applicable

Table 3 Investigation into vessels

PFOS foam was found on two vessels (below). The investigation found no PFOS-containing foam on the following vessels: m.v. Spirit of Canterbury (China Navigation Company NZ Ltd), m.v. Anatoki (Coastal Bulk Shipping Limited), m.v. Buffalo (Holcim (NZ) Limited), m.v. Aratere, m.v. Kaiarahi and m.v. Kaitaki (Kiwirail), m.v Tangaroa (NIWA Vessel Management Limited), m.v. Pacific Runner (Offshore Solutions Ltd), m.v,: Potiki (Port Otago Limited), 7 x Seaworks Ltd vessels, m.v. Sea Pelican (Southern Ocean Specialists NZ Limited), m.v. Straitsman and m.v. Strait Feronia (Strait Shipping Ltd), and m.v. 'Awanuia' (Z Energy Ltd).

Operator	Ship	Type of firefighting foam?	Amount (litres)	Concentration	Status of foam as of March 2019
Lyttelton Port Company Limited	m.v. 'Tug Purau'	3M PFOS	490 plus 1400	Foams: 0.94% (9,400 ppm) and 0.43% (4,300 ppm)	Actively working with environmental consultants to manage
	m.v. 'LPC Rescue'	No			Not applicable
	m.v. Blackadder'	No			Not applicable
Marine Services Auckland Limited	m.v. Maui 1, Auckland	3M PFOS		0.12% (1,200 ppm)	Have engaged environmental consultants to prepare a plan; foam is stored securely

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Further information

More detailed information is available on our website at **www.epa.govt.nz** or by contacting us directly.

Email
info@epa.govt.nz

Phone
+64 4 916 2426

Postal address
Environmental Protection Authority
Private Bag 63002
Wellington 6140
New Zealand

Physical address
Level 10
Grant Thornton House
215 Lambton Quay
Wellington 6011
New Zealand

Environmental Protection Authority
Te Mana Rauhī Taiao

New Zealand Government